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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/627,418	07/27/2000	Tatsuya Usami	00N010-US	1182

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EXAMINER

QUACH, TUAN N

ART UNIT PAPER NUMBER

2814

DATE MAILED: 06/03/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicant No.

09/627,418

Applicant(s)

USAMI, TATSUYA

Examiner

Tuan Quach

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 April 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 14 is/are allowed.
- 6) ☒ Claim(s) 1-5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 July 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This application presents a claim for subject matter not originally claimed or embraced in the statement of the invention. See newly added claim 14 regarding the multilayer insulating layer of a middle layer of PAE and an upper insulating layer and a lower insulating layer of HSQ and opening formed therein as in claim 14. A supplemental oath or declaration is required under 37 CFR 1.67. The new oath or declaration must properly identify the application of which it is to form a part, preferably by application number and filing date in the body of the oath or declaration. See MPEP §§ 602.01 and 602.02.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lopatin et al.

Lopatin et al. teach copper 24 and low dielectric constant layer, e.g., layer 30 including HSQ material thus possessing the property that Cu is unlikely to enter it since the same material is employed. The provision of via in low dielectric constant 50 followed by barrier layer 54 and copper 58 is also taught. See column 6 line 4 to column 7 line 21. Although Lopatin et al. do not explicitly recite the Cu concentration to be equal or higher than 10^{19} atoms/cm³, such would have been encompassed in Lopatin et al. since the concentration therein is not required or limited to be below the said value, and since

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the optimization of such concentration to obtain a desired conductivity would have been obvious to one skilled in the art.

Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lopatin et al. as applied to claims 1 and 2 above, and further in view of Zhao et al.

Lopatin et al. as applied above show also the barrier but do not recite the adhesion language, the use of tungsten and the same etching rate.

Zhao et al. teach various the conventional use of liner in conjunction with copper wherein the barrier also provides adhesion, including the use of tungsten for such material. See column 4 lines 52 to column 5 line 25. -63. The provision of openings 24 and 25 in various low dielectric constant material, e.g., layer 14, followed by copper conductor, e.g., 29 including barrier/adhesion is also shown. See column 6 lines 10 to column 8 line 45.

It would have been obvious to one skilled in the art at the time the invention was made in practicing the above invention to have included the tungsten barrier/adhesion layer in question to improve adhesion/barrier characteristic in the copper interconnect. The selection of the same etching rate would have been obvious and would have been within the purview of one skilled in the art to facilitate the removal of the wiring line and the adhesion/barrier layer.

Claim 14 is allowed. The prior art of record do not show the particular feature claimed in this claim particularly regarding the PAE/HSQ/PAE employed as the multilayer insulating layer in conjunction with the plurality of wiring lines as delineated in the claim.

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Applicant's arguments filed November 14, 2001 have been fully considered but they are not persuasive.

Applicant argues that the prior art to Lopatin et al. does not teach the particular concentration. Nonetheless, Lopatin et al. nowhere excludes the concentrations in question. There is no reason to be so limited as the prior art nowhere requires the limitations delineated by applicant, particularly given that HSQ is employed in the prior art. It remains that such concentration would have been obvious and would have been encompassed in the prior art. The claims for instance are deemed unpatentable over other prior art where HSQ is employed as delineated by the Japanese Office action. Applicant further argues that the prior art requires the barrier layer. Initially, the claimed structure does not preclude such barrier layer. Furthermore, the instant application on page 15 line 10 employs barrier 104. Applicant also argues that narrow pitches of $0.2\ \mu$ can be obtained. The claimed structure nonetheless does not require such narrow pitches and are silent regarding any pitches. Furthermore, Lopatin et al. does not appear to be precluded from such pitches. Regarding claim 4, the process does not impart patentability into the claimed structure which is devoid or silent of any etching. The selection of an etching rate essentially equivalent to an etching of the wiring lines, to the extent that such etching rate can be determined from the claim, does not impart patentability into the product claim. To the extent that applicant's layer correspond to the tungsten layer such is known as shown in Zhao et al., column 5 line 24, column 8 lines 30-35 evidencing the similar material. In any event, the material encompassed corresponds to well known materials as delineated in Zhao et al.

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THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Quach whose telephone number is 703-308-1096. The examiner can normally be reached on M-F from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


Tuan Quach
Primary Examiner